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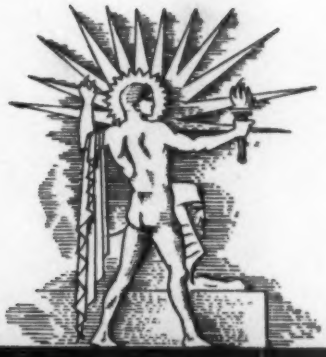
SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •



FEBRUARY 9, 1935

Outside the Rules

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The Weekly Summary of Current Science

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Edited by WATSON DAVIS

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DO YOU KNOW?

The commercial products of a large walrus are worth less than $50 as oil, skin and ivory.

Albino Indians were kept in zoological gardens by native Mexican rulers, and sacrificed to the sun at the time of an eclipse.

Millions of gallons of blackstrap molasses from the Philippines, Hawaii, and Puerto Rico are one corn substitute being fed to stock in the United States.

To increase the keeping qualities of Swiss cheese, one company in this country is "veneering" its product, before wrapping, with pasteurized sheets of hole-less cheese.

A "nicofumer" is a new atomizer-like device designed at the University of California Citrus Experimental Station, to apply nicotine sprays to plants, in insect pest control work.

Greek women were the first to raise pot-plants.

The average child acquires 80 per cent. of his education through his eyes, says the National Society for the Prevention of Blindness.

A statue of an armed warrior recently found at Capestrano, Italy, has been pronounced of the sixth century, B.C., and the oldest statue ever found in the country.

Two leaves of second century A.D. papyrus, acquired by the British Museum, are said to be fragments of a newly discovered Gospel, dealing with the life of Christ.

Trachoma is so rare in Switzerland that it has been suggested high altitudes prevent this eye disease; but this is disproved by presence of the disease at various altitudes in the American Rockies.

WITH THE SCIENCES THIS WEEK

Most articles are based on communications to Science Service or papers before meetings, but where published sources are used they are referred to in the articles.

AERONAUTICS

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PSYCHIATRY

Why are some types of psychopathic personalities generally considered sane? p. 93.

PUBLIC HEALTH

What are the plans for expenditure of $10,000,000 for health research? p. 86.

What method is recommended for making drinking glasses sterile? p. 84.

AVIATION

Slot in Plane Wing Prevents Dangerous "Dead" Air Space

Better Lift at High Angles, Reduction of Stalling Hazard Expected Through Adoption of Simple Device

GETTING rid of stalled "dead" air by use of an aerial vacuum cleaner system promises to increase materially the rate of climb of aircraft, lessen the danger of stalling in attempts to climb too fast, and decrease the landing speed of airplanes.

How hazardous "dead" air on the uppper surfaces of airplane wings is sucked away through a narrow slot on the front upper surface by a vacuum was demonstrated before the meeting of the Institute of Aeronautical Sciences by Eastman N. Jacobs, scientist of the National Advisory Committee for Aeronautics.

By motion pictures made at Langley Field, Va., in an experimental wind tunnel Mr. Jacobs showed with smoke streams how the system of vacuum slots gets rid of the dead air stalled on the top of the wing if an airplane tries to climb too fast.

Using a high speed camera peering through a hole in the wind tunnel, Mr. Jacobs obtained a reel of film showing at what angles of attack of the wings stalling would occur and how much greater this crucial angle becomes when the vacuum cleaner system is used.

Technically the angle of attack is that angle between the horizontal line through the wings as the plane rests on the ground and the line in the direction of the oncoming air stream. The angle of attack varies as a plane climbs or dives. For high angles of attack, the more the nose of the plane points upward the faster it will climb.

The Stall

Attempts to head upward, increase the angle of attack, and hence climb more rapidly reach a stage, however, where the smooth air streams flowing over the upper wing surface break in turbulence as the oncoming stream rides over "dead" air stalled on the upper wing surface. At this point the lift on the plane is lost and the plane stalls.

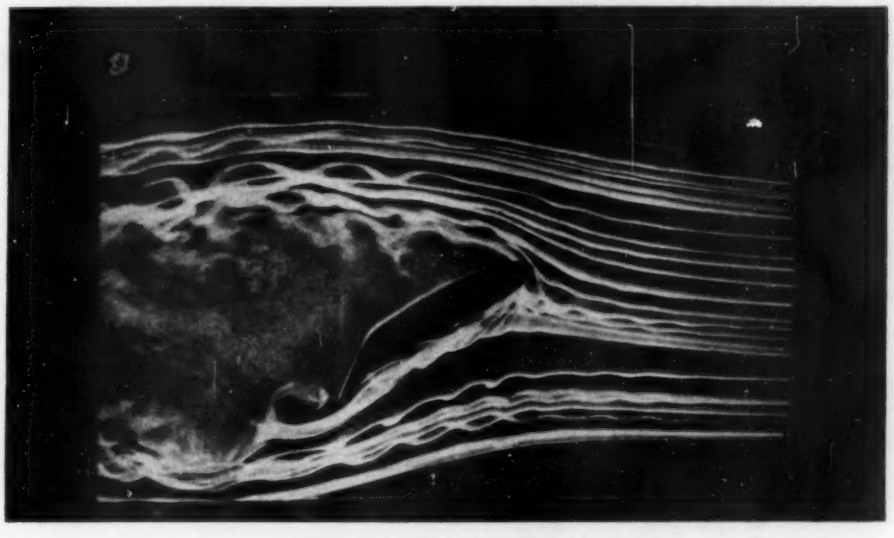
In the motion pictures exhibited by Mr. Jacobs it was shown that for high angles of attack where this separation of the air stream occurred and the model theoretically "stalled," the condition could be removed by the use of the front edge slot with its partial vacuum. Dead air causing the condition was dragged into the slot and the smooth air flow over the wing was resumed.

The two accompanying views show how use of this aerial vacuum cleaner system breaks up dead, trapped air on airplane wings which leads to stalling in aircraft. The upper picture shows the splitting of the air stream over the upper wing surface as the stream overrides the stalled, dead eddies formed when a plane tries to climb too fast.

The lower picture shows smooth air stream formed again when a narrow vacuum slot on front upper edge of wing sucks away the stalled air. The pictures were taken by Eastman N. Jacobs, scientist of the National Advisory Committee for Aeronautics at Langley Field, Va.

Science News Letter, February 9, 1935

Winds traveling 100 miles an hour have been registered by the wind gauge on top of the Empire State building, 1,265 feet above New York's streets.



WHEN A PLANE STALLS

STALL PREVENTED

ASTRONOMY

New "Farthest Out" Set At Three Sextillion Miles

Tiny Nebula, Photographed With 100-Inch Telescope, Using Ultra-Fast Plate, Required 3½-Hour Exposure

ASTRONOMY'S "farthest out," a faint nebular "universe" of stars three sextillion miles (3,000,000,000,000,000,000,000 miles) from earth, has been sighted by the famous 100-inch world's largest telescope of the Carnegie Institution's Mt. Wilson Observatory.

Using a new, experimental photographic plate, the Mt. Wilson Observatory astronomers have thus extended the observational limits of the 100-inch telescope approximately a third as far again as the previous record.

The nebula just discovered, whose estimated distance is 500,000,000 light-years, to use the yardstick of the astronomers, is traveling through space outward at the amazing rate of 50,000 miles per second, which is more than a quarter of the 186,000 miles per second speed of light, fastest speed in the universe.

Dr. Edwin P. Hubble, veteran discoverer of nebulae and discoverer of the relation between nebular speed of recession and distance from earth, explained that this velocity is based on the assumption that the relationship between speed and distance holds true in the extreme outer reaches of the universe now probed by the giant Mt. Wilson telescope.

To capture the image of the nebula, the faintest object recorded, required a 3½-hour exposure. The photographic plate used was about twice as fast as those ordinarily employed to photograph faint objects. The most distant nebula appears as a minute spot.

The recessional speed of distant nebulae is based on the shift of the lines in their light spectrum toward the red, the so-called "red-shift." This displacement of lines has been interpreted as being caused by an actual rushing away of the nebulae. And the more distant the nebulae, the greater the red-shift and the speed of recession. This has been demonstrated by Dr. Hubble observationally and it also follows from the Einstein theory of relativity. The fact that the farthest out portions of the universe are rushing away fastest gave rise to the idea that the whole universe is expanding at a tremendous rate.

Just last December the scientific world was told that Dr. Hubble has found a nebula with a recession of 24,500 miles per second, indicating a distance of 245,000,000 light-years. The new discovery just about doubles this record.

A light-year is the distance light travels in a year, about six trillion miles.

Science News Letter, February 9, 1935

ETHNOLOGY

Ancient Navajo Language Now to Be Written

A YALE professor, a scientist-priest, and a Navajo Indian are working together on a book.

It is to be a handbook, to aid the Office of Indian Affairs in its project to teach Navajo Indians to read and write their own language.

Thus, the Government forges ahead on an experiment which has extraordinary aspects.

The Navajo tribal language, spoken for centuries, kept alive even with pressure of English and Spanish around it, is entering upon a new estate. It is to become a language that can be read and written by its people.

Never before have Navajo Indians been able to see their "literature" in native print. Now, the biggest tribe in the United States, 42,000 strong on its reservation in New Mexico and Arizona, is to become bilingual in all-round fashion. The children are to take reading and writing lessons at school in two languages, English and Navajo. The Government will send its communications in both languages, so that any Navajo can see for himself what the Government has to say, or can have it read straight to him in his own language. Since many Navajos speak no English, they have had to depend on interpreters in the past to explain the words of the Government.

An institute for interpreters is being held during January and February on the reservation, to bring the Navajo language up to date, so to speak. With Navajos busy with soil erosion projects, health programs, and education plans, interpreters who explain it all to Navajo-speaking Indians have a hard time. At the institute, specialists doing technical work on the reservation will help the interpreters to find the best Indian terms for modern projects.

The afore-mentioned handbook, being prepared by Prof. E. Sapir of Yale University, assisted by Father Berard Haile of Gallup, N. M., and Albert Sandoval, a member of the Navajo tribal council, is intended as a basis for teaching Navajo to Indian service workers in the field.

Navajo was studied and reduced to writing some years ago, for scientists only to read—most people would have said. Now, that scholarly study which seemed of interest to a small, select group only, has become the foundation for giving an Indian tribe a new cultural asset.

Science News Letter, February 9, 1935

PUBLIC HEALTH

Find Thousands of Germs On "Clean" Glasses

THOUSANDS of bacteria on the rims of supposedly clean, germ-free drinking glasses—as many as 50,000 to 100,000 bacteria on a single glass—were discovered by Prof. W. L. Mallmann and E. D. Devereux, research associate, of the Michigan State College.

These bacteriologists have been investigating the sanitary condition of glasses at roadhouses, taverns, and saloons in cooperation with the Lansing department of health.

"The possible role of eating utensils as a factor in the transmission of disease has been demonstrated from time to time over a period of years," they said in explaining their scientific report made to the Society of American Bacteriologists.

Tableware has been shown to be a carrier of the organisms causing diphtheria, pneumonia and tuberculosis and of two kinds of dangerous streptococcus "germs," they pointed out.

"Since the repeal of prohibition there have sprung up numerous road houses, taverns and saloons for the dispensing

of alcoholic beverages. Many of these places are inadequately equipped with means of cleaning and sterilizing glassware. In many places not even running water is available, to say nothing of hot water. As a result various methods of cleaning and sterilizing glassware have developed, many of which are extremely questionable."

Their investigation was started some months after a local health ordinance had gone into effect requiring the use of a chlorine rinse containing 200 parts per million of chlorine as a sterilizing agent for beverage glasses. Prof. Mallmann and Mr. Devereux examined both the rinses being used and the glasses. Clean and dirty glasses were tested by swabbing the rims to a depth of half an inch on the inside and outside.

Few of the glasses were entirely free of germs, and as many as 50,000 to 100,000 bacteria were found on some. In most cases, there were more bacteria found on the rims of the clean glasses than the dirty ones. This, Prof. Mallmann explained, is because the bacteria are washed off into the beverage in the glass. Nevertheless many of the dirty glasses and some of the clean ones had streptococci on their rims.

As a result of their investigation, the bacteriologists recommended certain provisions for sterilization of glasses. These included preliminary rinsing of the glasses to remove all beverage or other material, immersion for at least five minutes in the chlorine rinse or shorter immersion followed by five minutes draining without running off the chlorine water, and then a final rinsing in clean ice water or running tap water.

After these recommendations were made effective by the local health department, the bacteriologist revisited a number of places and found an improvement in the condition of the glassware.

Science News Letter, February 9, 1935

MARINE ENGINEERING

New Type Sailboat is Minus Foresail, Boom, and Stays

See Front Cover

PAGE the Ancient Mariner! Yachtsmen of Stockholm are discussing a new type sailboat without foresail, boom or stays; a craft so fast that it has beaten larger rivals in recent tests. Yet it is so simple to handle that the yachting experts expect the rules of small boat racing may be changed to take advantage of certain of its novel principles.

Invented by Dr. Fredrik Ljungström of the Academy of Engineering Sciences, Stockholm, the new type boat has a revolving mast on which the mainsail is wound up like a window shade on its roller.

To reduce sail area, as in orthodox reefing, the navigator simply turns a wheel at his elbow in the cockpit and rotates the mast by a system of ropes. Ball bearing rollers in the foot of the mast below decks make this rotation easy.

The mainsail is triangular but double. Running before the wind the double sail opens out into what looks like a great parachute jib sail. For tacking into the wind one sail lies smoothly on top of its mate.

Aerodynamic streamlining is achieved in the sail by having its forward edge fixed in a slot on the bow side of the forty-six foot pine mast. Thus there is no gap between the mast and sail as in ordinary craft.

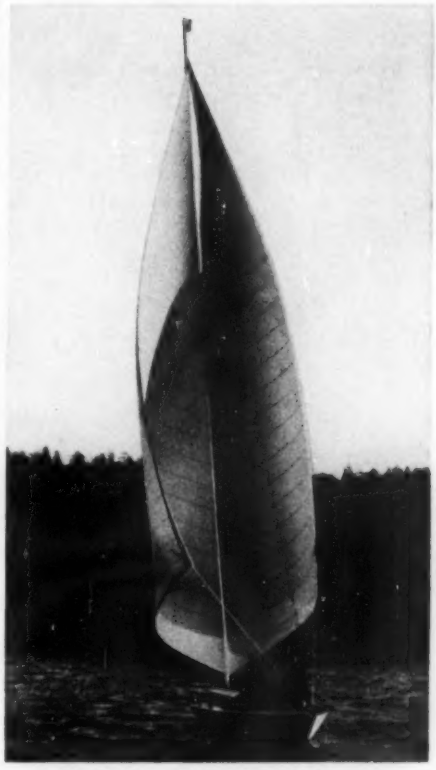
As the sail fills its general shape resembles an airplane wing; thick and round at the front and narrowing off behind.

The only stay on the boat is tiny wire running from the tip of the mast to the stern. Such a lack of stays may arouse yachtsmen's suspicions; but Dr. Ljungström has sailed his boat in heavy weather with excellent results.

The lack of stays is one reason for the speed of the boat. Stays—the fixed rigging which keeps the mast in position—have more wind resistance than is sometimes commonly believed. Although the surface area of the wires may be small they vibrate in the wind and hence greatly increase their resistance to a breeze.

For small-craft yachtsmen the new Swedish boat has the following advantages:

1. Less and cheaper rigging.
2. Sail cost reduced because only one sail is needed.



NO BOOM OR STAYS

Also without foresail is the new type sailboat from Sweden. Running before the wind its double sails open out to give giant parachute effect. On tacking into the wind the two sails lie one atop the other. Reefing of sails is accomplished by means of a revolving mast around which the sail winds like a window shade about its roller.

3. Fewer torn sails because of faster reefing by simply winding the sail around the mast to reduce its area.
4. Less danger of accidents to persons and also to sails caused by a swinging boom. There is no boom to swing.

It is against the rules of yacht racing to use a revolving mast as does Dr. Ljungström's new craft. Because of the importance of the new invention, however, a movement is originating in Sweden to change this rule.

Sail area of the new boat is thirty-two square meters, or about 345 square feet, when the two sails lie atop one another as in tacking. The sail area is 690 square feet in running before the wind.

Reports Science Service's Swedish correspondent:

"The boat is frightfully fast and has easily beaten larger boats against which it has sailed. Most amazing is the way the new boat beats up against the wind, quicker, and nearer the wind than other boats."

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CONSERVATION

Game Restoration Fostered In Combating Soil Erosion

GAME BIRDS and animals are being increased in numbers as a profitable by-product of the Government's war against soil erosion. At the New York meeting of the American Game Conference, Ernest G. Holt, chief forester of the U. S. Soil Erosion Service, told of encouraging results already achieved as a beginning, and of further steps that can and should be taken as the work matures.

Growing trees, shrubs and smaller plants will be the main reliance for anchoring the soil after the worst gullying has been checked by dams and other engineering devices. These plantings, Mr. Holt said, are being selected with special thought to their value as game cover and food sources. Further steps to insure success will include continued scientific supervision and cooperation with other agencies, especially state and local authorities; encouragement of wildlife research, and maintenance of strict scientific standards; preferential treatment for native game species; and efforts to promote the highest possible standards of sportsmanship.

As a concrete example of results already accomplished, Mr. Holt cited the case of the Coon Creek erosion project in Wisconsin, which has now been in operation for a full year. Here the quail population has been brought through a winter with practically no losses, and the total stock of these birds nearly doubled.

Need Encouragement

Legal limitations on the amount of game killing are not enough, if we are ever to have a restoration of the game abundance our forefathers enjoyed. Positive encouragement must be given to all forms of wildlife, and the Federal Government is prepared to take the initiative vigorously toward this end, F. A. Silcox, chief of the U. S. Forest Service, told the Conference.

The policy of the Government in the past has been to offer aid and cooperation to the states in the protection of wildlife, but it has always left the initiative with the states. However, it has been found that in the era of more active and positive measures now found necessary, state fish and game commissioners often find their hands tied. In some cases this is due to legislative limitations, which restrict them to protecting the birds, animals and fish. In others, lack of funds or other hindrances are operative.

Expressing gratification at the progressive wildlife policies of many of the states, and the willingness of the Forest Service to continue and extend cooperation with these policies, Mr. Silcox continued:

"But there are other States in which —despite the cooperative attitude of game commissioners and continuous efforts by the Forest Service—no action, or obviously inadequate action, is in prospect. I want to make it perfectly clear that in such States, and under such circumstances, the Forest Service intends to take the initiative.

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FISHERIES

U. S. Initiates New Deal for Anglers

A NEW DEAL for fishermen with rod and reel was announced by Commissioner Frank T. Bell, of the U. S. Bureau of Fisheries, before the recent meeting of the American Game Conference in New York. Hitherto the work of the Bureau has been concerned mainly with the promotion and protection of commercial fisheries; but in Mr. Bell's concept the fishing sportsman is entitled to a "break" as well, and he has taken steps to see that he gets it.

Mr. Bell said: "I found a very decided demand for some kind of a service for anglers and created a division to meet the need. From the number of inquiries it received and the number of anglers and others who have appealed for assistance and advice, or information, on almost every conceivable subject pertaining to fish and fishing, I am convinced this division is rendering a much needed service to the angling fraternity."

In order that the fish may be there when the fishermen go fishing, the Bureau is continuing its very extensive work of hatching and rearing young stock for planting in streams and lakes. A new policy, first adopted by the Bureau as a result of lack of funds, has been the suspension of prepaying shipping charges on planting stock which it gives away. It is still possible for any one really interested in the promotion of better fishing to obtain free young fish, but they must now come and get them at the hatchery, or else help defray distribution costs. This, Mr. Bell pointed out, eliminates the "something-for-nothing boys," but does not discourage the true sons of Izaak Walton.

Science News Letter, February 9, 1935

PUBLIC HEALTH

$10,000,000 for Improving Health of the Nation

INVESTIGATIONS of health problems that vitally affect the lives of millions of Americans are needed in the immediate future, and there will be plenty of work for the approximately $2,000,000 research portion of the $10,000,000 health funds provided in the Administration's economic security bill before Congress.

Pressing problems are awaiting solution and disease fighters of the U. S. Public Health Service and the National Institute of Health are eager to extend and push forward their fundamental research.

Half a million men working at stone and granite cutting and similar "dusty" trades are victims or potential victims of silicosis, a lung disease that is serious in itself and more serious because it predisposes to tuberculosis. How can these men and other industrial workers be protected from the hazards of their trades?

Streams and lakes on which whole population groups depend for their drinking water are so badly polluted by industrial wastes that they are unfit for use. How can these waters be reclaimed and made safe and others saved from this fate?

Can the threatening spread across the nation of Rocky Mountain spotted fever and typhus fever be stopped before these diseases grow to the proportions of the old-time plagues that spread devastation throughout the land?

It is easy, too, to see where the other $8,000,000 can be wisely spent in measures to protect the national health. It is no secret that city, county and state health departments have been badly crippled in their vital services because of depression budget cuts. On the average, personnel and budgets for these

local and state health services have been reduced about 20 per cent., the American Public Health Association estimates.

The U. S. Public Health Service has already been given $1,000,000 from emergency funds to help out in this situation.

"But something more than these sporadic and temporary measures is needed to provide effective, well planned and conscientiously executed full-time health supervision," the *American Journal of Public Health* (January) points out.

"Obviously, public health service along lines now generally accepted and known to be effective, if extended to reach a large majority of the population, would make a real contribution toward economic security through minimizing the tremendous annual loss from preventable diseases which now amounts to hundreds of millions of dollars."

With $8,000,000 the federal health service can give much-needed aid to local health departments in their fight on malaria, venereal and other preventable diseases and in their efforts to provide public health nursing for state, city and county health authorities; and can help these officials to get more accurate and prompt reports of new cases of communicable diseases, so that outbreaks of smallpox, scarlet fever or meningitis, for example, can be checked at their start.

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ENGINEERING

Photographs Reveal Process Of Diesel Engine Combustion

USING special glass windows resisting temperatures up to 3,500 degrees Fahrenheit, aviation research scientists have just discovered how fuel oil burns in a Diesel engine.

New facts which are expected to advance the possibility of using Diesel engines in aircraft have been found by taking high-speed photographs through these windows. These facts were reported by A. M. Rothrock of the National Advisory Committee for Aeronautics Laboratories at Langley Field, Va., before the meeting of the Institute of the Aeronautical Sciences, in New York.

Mr. Rothrock showed motion picture film before the aviation meeting taken at the rate of 2,500 frames a second. The film upset views about how fuel burns in such engines; opinions which have existed since the Diesel engine was first invented in 1893.

The characteristic feature of the Diesel engine is that fuel oil is injected into the air of the cylinders which has previously been compressed by the stroke of the piston. Under compression the air temperature rises until it is high enough to ignite the injected oil. No electric spark is necessary. Previously it had been supposed that the oil began to burn as soon as it came in from the fuel jets. Mr. Rothrock's film proves that combustion occurs only after the fuel fills the cylinder.

G. W. Lewis, director of aeronautical research of the N.A.C.A., told Science Service the new technique should speed research in the Diesel engine field. Heretofore, he said, various types of fuel jets—as only one example—were made and inserted in the cylinders. How well they worked could be determined only roughly as long as it was not possible to see or photograph what was going on inside during combustion.

With the new windows and high-speed photography, however, rapid checks on performance can be obtained.

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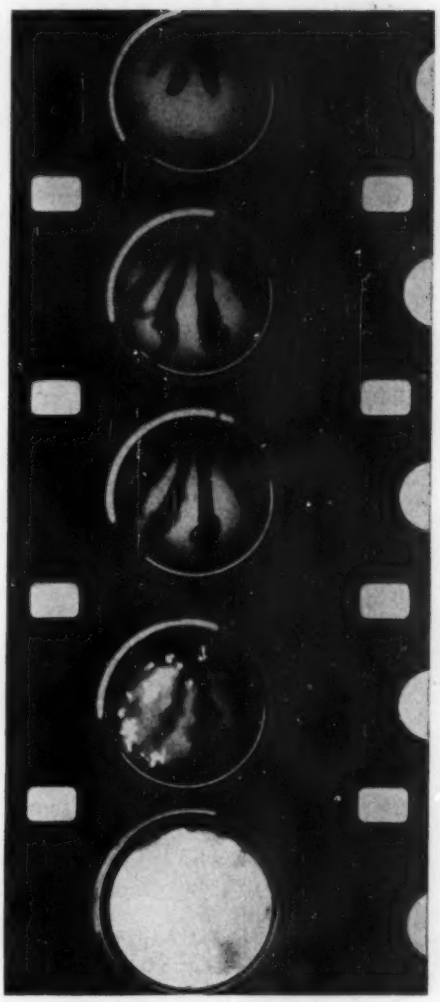

GOING ON INSIDE

Special heat-resistant glass windows enabled A. M. Rothrock, National Advisory Committee for Aeronautics scientist, to obtain these first photographs of fuel oil burning inside a Diesel engine cylinder. The top pictures show the fuel entering the cylinder through jets, the fourth shows tiny spots of flame beginning to appear, and the bottom one shows complete combustion one ten-thousandth of a second later than the previous view.

AVIATION—METEOROLOGY

Better Weather Service Foreseen for Aviation

BETTER weather service for the airways of America is foreseen by D. M. Little, chief of the U. S. Weather Bureau's Aerological Division, who described to the Institute of Aeronautical Sciences the recent extensive improvements in forecasting and weather reporting for those who fly.

The relatively new weather forecasting techniques, involving air mass and frontal analysis methods, have already been put into use in many aviation forecasting centers, Mr. Little explained.

At ten important air terminals, Atlanta, Burbank, Chicago, Cleveland, Dallas, Kansas City, Newark, Oakland, Portland and Salt Lake City, there is now 24-hour daily service, requiring the services of four highly qualified forecasters at each of the centers.

One of the recent improvements is the issuing of special trip forecasts for aviators, when requested, for periods up to 30 hours in advance to take care of long transcontinental flights which have become numerous in recent months.

Each day, in cooperation with the Army and Navy, weather sampling flights are made to heights of 17,000 feet. This is a new aid to weather forecasting.

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ASTRONOMY

Seek "Moon" Mountains On Tiny Planet Mercury

USING the moon as an astronomical "yardstick," scientists are about to determine whether the planet Mercury has a rough mountain and valley studded surface like the moon.

This is announced by the Carnegie Institution of Washington in a statement describing recent work by Dr. Edison Pettit and members of the astronomical staff of Mt. Wilson Observatory. Dr. Pettit has measured the changes in intensity of moonlight as this intensity changes with the various phases through which the moon passes each month.

The observations indicate that at full moon, the earth's satellite radiates four times as much heat as the visible light it reflects. At quarter phases the moon sends off radiant heat only one-sixth as intense as the amount at full moon. At this same phase also the reflected light is only one-seventh that at the full moon maximum.

The Mt. Wilson Observatory investigators find, too, that the rough, mountainous surface of the moon greatly lessens the radiant heat given off at the crescent phases in comparison with what it should be if the moon were a smooth sphere like a celestial billiard ball. It is this lessening of radiation due to the moon's roughened surface which will provide the astronomers with the "yardstick" for determining whether Mercury, also, has a rough surface.

Science News Letter, February 9, 1935

ARCHAEOLOGY

Welsh Farmhouse, 200 A.D. Had Neat Housekeeper

UNEARTHING a farmhouse, occupied in the second and third centuries of the Christian era, in Wales, a British archaeologist has found a prehistoric rarity—a house neatly kept.

Prehistoric houses were noted for untidy floors piled with refuse. In this dwelling, however, numerous crevices and cracks suggest to the discoverer the constant sweeping of a careful housewife

Four farms, one still practically intact, have been excavated at Caerau Farm, Caernarvonshire, Wales, reports B. H. St. John O'Neil who directed the research on behalf of His Majesty's Office of Works, Government agency in charge of antiquities. The Welsh excavations throw fresh light on farm life on the frontier of Roman rule in early Britain. The Romans fostered farming in Britain, regarding the island as an important granary of the Empire.

Evidences of the terrace system of plowing and planting hillsides have been found, also a cobbled roadway which led to the buildings. A stone-faced turf wall protected the farm animals against raids of Welsh tribes, and wolves that infested the hills.

Walls of the circular-shaped farm house still stand four feet high. A low stone bench was along one wall. A round work room and crucible were also found, possibly where farm implements were turned out.

The ground yielded iron nails, a little bronze with Celtic curvilinear ornament, and many fragments of pottery.

Science News Letter, February 9, 1935

ASTRONOMY

Plates Kept on Ice Reveal Heat of Stars

WITH THE use of special photographic plates so delicate that they must be kept in a refrigerator until used, astronomers at the Yerkes Observatory are learning new facts about the temperatures of the stars. Many previous estimates of these temperatures are wrong, it is believed.

Dr. William W. Morgan, of the observatory staff, is using a small six-inch reflecting telescope, attached to one of the larger instruments. With this he is photographing the spectra of stars by their infrared light and the rays of radiant heat. These are light waves too long to be observed with the eyes, and until recent developments in the preparation of extra sensitive photographic plates, they could not be recorded.

Previous estimates of the temperatures of the stars were based on a law discovered by the German physicist, Max Planck. According to it, the wavelength, or color, which is most plentiful in a star's light shifts from the red towards the blue end of the spectrum as the temperature increases. That is, a cool star of perhaps 5400 degrees Fahrenheit, would be red in color, but a very hot one, at some 50,000 degrees, would be predominantly blue. However, Dr. Morgan finds that some stars emit several times as much infrared light as they should according to the Planck formula. It therefore seems likely that the temperature estimate should be revised.

Science News Letter, February 9, 1935

IN SCIE

MEDICINE

Rickets in Rats May Be Cured by Phosphorus

RICKETS in rats was cured simply by adding the bone-building element, phosphorus, to the animals' diet, Drs. C. A. Lilly, C. B. Pierce and R. L. Grant of the University of Michigan Medical School reported (*Journal of Nutrition*, January).

The experiment shows definitely the place of phosphorus in the treatment of rickets, the investigators believe.

"Rickets in young rats is identical with rickets in children," Dr. Lilly stated in commenting on the possible human application of the studies.

The rats were fed on a rickets-producing diet and kept in a dark room, away from the rickets-preventing ultraviolet light of sunshine, until definite symptoms of the disease appeared. They were then divided into three groups.

One group was kept on the rickets-producing diet, with the result that the condition continued. Another group was given the same diet with the addition of a definite amount of viosterol, which is known to be a cure for rickets. The third group received the old diet plus a phosphorus ration. Both of the last two groups showed healing of the rickets within thirty days. Microscopic, chemical and X-ray examinations showed that the rats receiving the phosphorus improved as much as those receiving the viosterol.

Science News Letter, February 9, 1935

GEOGRAPHY

Leningrad University Has Chair of Polar Countries

LENINGRAD University has established a chair of Polar countries, the first to undertake training of scientific workers for biological and geophysical explorations in the Arctic.

A special boat for practical Arctic work is being equipped for the students. Prof. R. L. Samoilovich, director of the U. S. S. R. Arctic Institute, is head of the University project.

Science News Letter, February 9, 1935

E FIELDS

ASTRONOMY

Young British Astronomer Awarded High Honor

THE 1935 Gold Medal of the Royal Astronomical Society of London, one of the highest honors in astronomy, has been awarded to Prof. E. A. Milne, Rouse Ball Professor of Mathematics at Oxford University, "for his work on radiative equilibrium and theory of stellar atmospheres." Prof. Milne has worked out a theory which provides for the expansion of the universe in terms of an ordinary Euclidean, or three-dimensional, geometry of space.

The Gold Medals for both of the previous two years were awarded to American astronomers—Prof. V. M. Slipher of Lowell Observatory in 1933, and Dr. Harlow Shapley of Harvard College Observatory in 1934.

Science News Letter, February 9, 1935

ASTRONOMY

Millions of Meteors Add Little to Earth's Size

MILLIONS of meteors, or "shooting stars," dash into the earth's atmosphere every year and the stuff they are made of is thus added to the total mass of the earth. Yet the total bulk of the annual meteor fall is so little that at the present rate it would take ten billion years to increase the diameter of the earth by one inch.

Such is the estimate of Prof. C. C. Wylie, astronomer of the University of Iowa, based on meteor counts made by other workers as well as himself. He took into account some 20 to 24 million ordinary "shooting stars" estimated to fall every 24 hours, which range in size from sand-grain to pea, and from these on up to the big meteorites that burst with a bang, which are limited in number to about ten a year. Below the smallest naked-eye meteors are the microscopic ones that make trails visible only through a telescope. Above the "detonators" are the rare immense falling masses of iron or stone that make craters where they plunge into the surface.

Counting them all together, Dr. Wylie could calculate an annual fall of 3,120,000 kilograms of matter, or roughly 3,000 tons. Spread over the earth, this would give a depth of an inch in ten billion years. But according to the estimates of most cosmologists, the earth is only about half that age. Hence, concludes Dr. Wylie, the earth's radius would be increased, through meteor falls at the present rate, by only a fraction of an inch during the entire lifetime of our planet.

Science News Letter, February 9, 1935

AVIATION—METEOROLOGY

Weather Research Wins Aeronautics Prize

NOT for some improved airplane or engine, but for a bettering of weather forecasting accomplished by two Massachusetts Institute of Technology scientists has the first Sylvanus Albert Reed award of the Institute of the Aeronautical Sciences been given.

Prof. C. G. Rossby and Prof. H. C. Willett divide the honor for their application of the polar front theory to American weather forecasting. Born in Norway, air mass analysis in which the polar front theory is involved is now having rapid application in official American weather studies.

Dr. S. A. Reed of New York City has just endowed this new annual award for investigations that benefit practical aeronautics.

Science News Letter, February 9, 1935

ICHTHYOLOGY

Seek New Fish Species In Deep Guatemalan Lake

CLIMBING a 5,000-foot tropical mountain elevation in order to go fishing with a thousand-foot line, for fish that nobody has ever seen, is part of the program of an expedition which recently went out from the Academy of Natural Sciences of Philadelphia.

High in the mountains of Guatemala lies Lake Atitlan, known to be at least 1,000 feet in depth. Very few fishes have ever been collected from its surface waters, and none from its abysses. Scientists of the Academy expedition will lower specially built wire traps on long lines—and nobody knows what they will see when they reel them in.

The expedition personnel consists of Mr. and Mrs. Rodolphe deSchauensee, with Waldemar Fioravanti of Italy.

Science News Letter, February 9, 1935

ENGINEERING

"One Man Symphony" Made Possible by Sound Records

THE "one man symphony orchestra" is brought into the realm of possibility by a system of electrical sound recording devised by Prof. Vladimir Karapetoff of the Cornell University Department of Electrical Engineering.

Prof. Karapetoff's device makes it possible for a single performer to produce the effects generally achieved by a number of players. Each instrumental part is recorded electrically on a separate record. These records are then synchronized into one composite recording. The final record produces the effect of a complete orchestral group. Or one part may be cut out which the operator can play himself.

A teacher of electrical engineering by profession and a musician by avocation, Prof. Karapetoff conceived the idea of using the electric phonograph as a "partner and adjunct" in actual performance by instrumentalists and vocalists, rather than as a substitute for home singing and playing.

To put this idea in actual operation, he has assembled in his residence in Ithaca an elaborate outfit for making high-grade phonograph records on cellulose acetate and has added attachments to an electric phonograph for reproducing these records in connection with playing a musical instrument.

"Ensemble playing or singing is always more satisfying to an amateur than a solo performance," he explained, "and it is a great pleasure to perform with a phonograph record to fill in the other parts."

The records of accompaniments were made by Prof. Karapetoff himself, with the correct tempi, retards, and accelerations, but without gradations of the volume of sound. This latter is controlled by a resistance operated by the performer's foot, or by a second person familiar with the piece. In this way dynamic accents are introduced at will and the accompaniment is made to sound differently, depending upon the soloist, his mood, and the acoustic conditions of the room. Such accompaniment can be made for any musical instrument, using the piano or any other desired instruments as the background.

Science News Letter, February 9, 1935

There are at least 44 species of the cactus family growing naturally east of the Mississippi River.

MATHEMATICS

Thirteen Spades

Your Mathematical Chance of Receiving Such a Hand In Bridge Is One in 635,013,559,600 Deals

By ROBERT D. POTTER

TWO OR THREE times a year one can pick up the morning newspaper and read something like this:

"PARIS, Mar. 4—Samuel Spadoff died here today from a heart attack caused, physicians state, by being dealt the perfect bridge hand — thirteen spades."

Or the story may have a dateline from Pittsburgh, Pasadena, or Podunk, as the case may be. And, to keep the records straight, the lucky bridge player does not always die.

Thirteen spades—or any other suit to serve as trump—is the perfect bridge hand (always providing the opponents aren't clever enough to bid seven no-trump over the seven spades).

Are the stories in the papers about the "perfect" hands mere journalistic imagination, the work of joking friends who stacked the deck, or just plain unadulterated luck? Everyone who plays bridge, and there are something like 10,000,000 bridge players in the United States alone, has asked this question.

What is the mathematical chance of being dealt thirteen spades? Pull down your hat, button your vest, tighten your belt and hold your breath—the answer comes out to be one chance in 635,013,559,600 deals.

Eight Years

All of which means that if every one of the 10,000,000 bridge players in the U. S. dealt twenty bridge hands 365 days in the year it would take the whole group of enthusiasts—or would they be lunatics?—just about eight years, eight months and one week to deal enough hands to get a single one containing thirteen spades.

The two leap years coming in that time, bringing two extra days, will add a mere drop in the bucket—about 40,000,000 deals—but perhaps it may be best to provide two days of rest in eight years for the "bridgers."

No one, not even the bridge "experts," averages twenty deals a night for a year straight. That's why mathematicians and even the laymen, who admit they know little about it, scoff at the frequency with which perfect trump hand stories appear in the newspapers. The world would have to be the maniac-like place pictured to obtain the results by sheer probability alone.

Go ahead and scoff. Charge off 80 or even 90 per cent. to hoaxes on the part of newspapermen portrayed not as they are, but after the fashion of Hollywood; anything for a laugh. Even the 10 or 20 per cent. left is much too high.

Practical Joker?

After questioning the veracity of the newspaper story, consider the chance of the deck being stacked while the potential victim was out of the room. Suppose that once out of a million deals in the world of bridge some practical joker does stack the deck. What then is the chance that an all-spade hand will be dealt by the normal course of play?

Without plodding through the calculations the chance is still only one in 159,000.

Lest one grow dizzy worrying about chances of a million or billion to one, it may be best to explain that the figures cited are all right mathematically, but conditions necessary for perfect calculations by the laws of probability are not completely satisfied in a bridge game as most people play it.

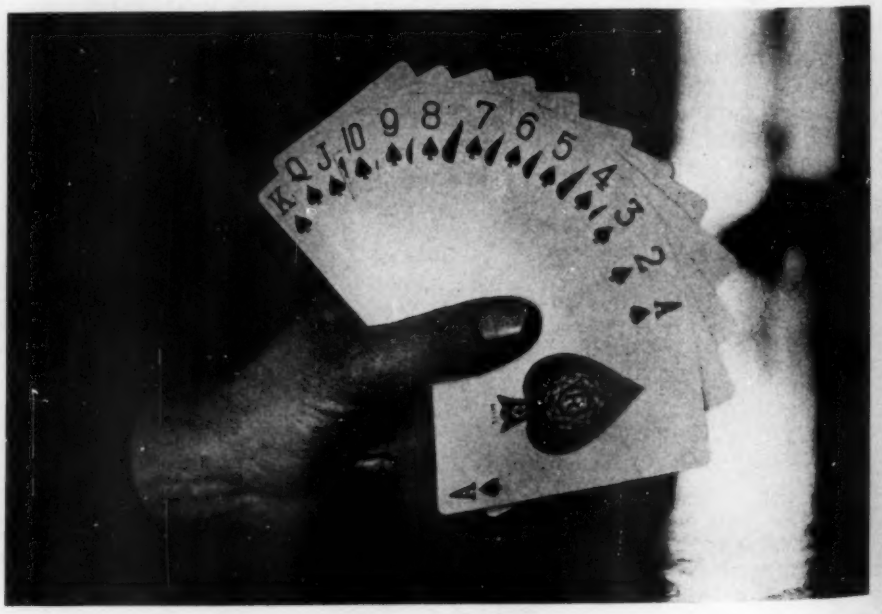
Honestly "Stacked"

Why won't straight mathematical probability apply in a game of bridge? Just because most people are too lazy or haven't time and patience enough to break up the pattern of the cards by shuffling thoroughly after each completed deal.

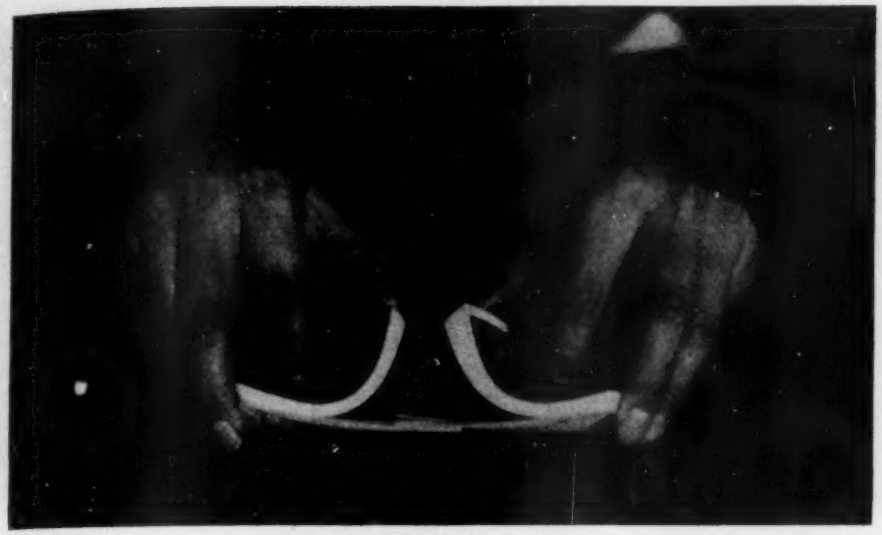
The scoffer's suspicions that some of the "perfect" bridge hands are the result of stacked cards may be right, but not in the way they suspect. Cards have a way of stacking themselves by building up patterns through the necessity of following suit in the course of play.

You lead a spade on the first round. Everyone follows suit. Thus four spades are grouped together. You believe spades will "go round" again so you lead another. They do. That makes eight spades in the group.

If the shuffling on the next hand is lazy, or distracted by postmortems or



THE PERFECT HAND



BUILDING GOOD HANDS

It is only by thorough shuffling that the combinations of the play are broken up and the dull hands of 4-3-3-3 cards, by suits, are prevented.

gossip, one may build up a deck of cards which is partially stacked.

Breaking up the card pattern is real work. In more than half of the thirteen tricks in an average hand of bridge, all players will follow suit. If such a pack were dealt without shuffling, each set of four cards would go out, one to each player, and on the next deal there would be still more tricks in which everyone followed suit. If this were repeated, eventually all four players would be getting hands containing 4-3-3-3 cards, by suits, or similar balanced patterns.

For what few "non-bridgers" there are left in the country, it may be explained that nothing helps more to make bridge monotonous as a game than these balanced hands. There are no thrills of slams and high scores when the cards start running that way.

Relief By Shuffling

Just to get away from this monotony, the pack of cards is shuffled after all the thirteen cards in each hand are played. Only when one has a perfect random distribution of the cards after the shuffle will the factors underlying the mathematical laws of chance enter with fair certainty.

Just as the cards will try to work themselves into the balanced pattern, so too will they build up on rare occasions into more thrilling hands where two and more people will hold seven, eight, or nine cards of a suit. Then the packets of four cards on each trick will often contain only two cards of the suit led. And the chances are better that every fourth card will be of the same suit. This means, of course, that on the next deal chances are better that one player may receive the perfect hand.

Without trying to teach the game of bridge, the matter can be summed up by saying that mere talk of probabilities is one thing, but the game of bridge in practice is something else again.

Remember Combinations

Prof. L. F. Woodruff of the electrical engineering department of Massachusetts Institute of Technology, who has gained an additional reputation for his avocation of bridge and card probabilities, comments on how the master bridge players use their knowledge of chance and card patterns in their methods of play.

Writing in a recent issue of the *Technology Review*, Prof. Woodruff says, "It is almost inconceivable to the average player the number of combinations which some of the leading experts carry in their minds during match play. Not only are the probabilities considered, but at least one player of the writer's acquaintance actually makes use of the combinations that existed in the deck before the shuffle in deciding the play of the hand, on the theory that the ordinary imperfect shuffle fails to break up completely the groupings from the preceding hand."

Most people don't do it, but to start breaking up previous card patterns, four hand shuffles on each deal are necessary. Because of the cyclic nature of the average shuffle and the failure to interleave all the cards properly, an approximate approach to true randomness is hard to attain, Prof. Woodruff indicates.

For players who don't like the evenly distributed hands containing 4-3-3-3 cards in the respective suits, various dealing devices have been introduced which, by a scattered type of dealing, actually shuffle and deal the cards in one operation.

Avoids "One Around"

Such "shuffle dealing" may give two cards in a row to North, then three to East, one to West and so on, until each hand finally has its allotted thirteen cards. The main idea of all of these devices is to get away from the old cyclic method of dealing in rotation from left to right around the bridge table.

Prof. Woodruff, who in his spare moments devised a card "shuffle-dealing" device, has made one of the few tests to determine how the trick-taking value of hands, as measured by their long and short suit values is affected by the number of hand shuffles after each deal.

"A hundred hands of bridge were dealt," explains Prof. Woodruff, "after each of the several procedures for shuffling the cards. Before each shuffling the cards were grouped into tricks of four cards of the same unit. First the cards were given one manual shuffling before dealing, for a hundred hands.

"Then one hundred hands were dealt which had been shuffled manually twice; next three times, and then four times."

Increased Trick Value

Using a popular system of computing the trick value of the hand in long and short suits, each additional deal produced more long and more short suits and increased the trick value in this way:

One shuffle averaged a value of 2.02 tricks per hand.

Two shuffles averaged a value of 2.25 tricks per hand.

Three shuffles averaged a value of 2.47 tricks per hand.

Four shuffles averaged a value of 2.63 tricks per hand. Completely random distribution of the cards, produced theoretically only by an infinite number of shuffles, yields—it can be calculated—an average value of 2.64 tricks a hand.

Similar studies of the trick value in long and short suits for a card dealing

machine showed that an average value of 2.84 tricks for each hand could be obtained. This came about because the greatest number of cards by suits in a bridge hand, dealt for even the ideal case of perfect randomness, are of three cards each. As such they have no trick-taking value based on the long and short suit designations.

With the card dealing apparatus, four instead of three card suits appeared with the greatest frequency, and there was an accompanying increase in two cards and one card short suits. Either length or shortness in a suit is necessary to obtain the trick values being considered in Prof. Woodruff's research.

Moral: If you can't afford a card dealing machine, always shuffle the pack four times.

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Science News Letter, February 9, 1935

ARCHAEOLOGY

Uncovers Evidence of Early Mammoth Hunters

A TEXAS county judge, J. A. Mead, turned amateur archaeologist, has unearthed important evidence regarding the most elusive characters of America —the shadowy mammoth hunters.

These ancient Americans are believed to have hunted long-vanished types of big game with stone-tipped spears some 15,000 or 20,000 years ago.

Digging in a farmer's field seven miles northwest of Miami, where he presides over the Roberts County court, Judge Mead unearthed a stone dart point lying directly between two ribs of one of the big mammoths or elephants that once lumbered over Texas plains. Two witnesses, "responsible citizens," watched while the Judge removed from the earth some of the teeth and big bones of the fossilized animal.

Finding a hand-made weapon among bare bones of a long-dead elephant is fairly strong circumstantial evidence that a man slew the elephant. Archaeologists are seeking just such evidence, carefully uncovered, to build up the case for the existence of ancient Americans.

Judge Mead reported his evidence to Floyd V. Studer, director of archaeology for the Panhandle-Plains Historical Society, who at once visited the site.

Announcing the discovery to Science Service, Mr. Studer said:

"While I have personally found several true Folsom or Yuma points in this immediate area, this is the first time one has been reported in direct association with fossil mammals.

"The bones were found in blue-green clay, which indicates a lake bed. There is no evidence of river or stream sand. This blue-green formation lies undisturbed about 18 inches below the present soil level."

The weapon found with the elephant's ribs is described as four and a half inches long. It does not have a groove down its entire center, as the typical Folsom darts do. But in some other respects, such as the smooth edge of the base, it is characteristic of certain weapons ascribed to the age.

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The discovery site is not very far from Clovis, New Mexico, where Dr. Edgar B. Howard of the University Museum, Philadelphia, has made notable discoveries indicating existence of early inhabitants in the region. It is also not far from Folsom, New Mexico, where one of the first startling clues suggesting that America was inhabited more than a very few thousand years ago came to light.

Science News Letter, February 9, 1935

ARCHAEOLOGY

Discovery of Edomite Ruins Dates Coming of Israelites

DISCOVERY of the fortresses of the Edomites, Bible enemies of the Israelites, has given science a new, strong clue to the century when the Israelites marched toward their Promised Land.

An expedition by four institutions, exploring the Arabah Valley of Transjordania by camel and motor car, has traced the boundaries of the ancient Edomite Kingdom, locating important Edomite cities, villages, and fortresses, reports Dr. Nelson Glueck, of Hebrew Union College at Cincinnati, one of the four institutions taking part.

The Edomites, explains Dr. Glueck, blocked the way of the Israelites as they moved northward from Egypt toward their Promised Land. The kinds of pottery found today in the deserted kingdom of the Edomites show that they were established there between the thirteenth and the eighth centuries B. C.

"The date of the Exodus must be assigned to the thirteenth century, B. C.," declares Prof. Glueck on this evidence.

Had the Exodus taken place earlier than that century, it is reasoned, the Israelites would have found neither Edomites nor Moabites to oppose their progress. And according to Biblical account in Numbers 20, the Israelites were compelled to go around Edom. Had the Israelites come earlier, he added, they would probably have occupied the territory of Edom themselves, leaving Palestine farther north for later comers.

The first known fortresses of the Edomite enemies of Israel were large walled enclosures, built of rough flint blocks, and strengthened with revetments and towers. Edom, Prof. Glueck says, was a highly civilized and intensively settled country in the days when it stood in the way of the advancing Israelite forces.

Science News Letter, February 9, 1935

PHYSIOLOGY—CHEMISTRY

Pharmacologist Drinks Heavy Water in Experiment

TAKING the risk of swallowing ten grams (about third of an ounce or teaspoonful) of "heavy water," Prof. Klaus Hansen, Oslo University pharmacologist, reported that he had apparently suffered no ill effects after five hours, sufficient to allow assimilation of the deuterium-containing water.

Nevertheless he was attended by four doctors ready with stomach pumps, heart and respiratory stimulants for emergency use if they seemed to be needed.

In his first human test of the possible poisonousness of heavy water, discovered in America in 1931, Prof. Hansen intends to keep taking doses of the heavy water each day for two weeks until the daily dose is increased to a hundred grams of water of which 99 per cent. of the hydrogen is the heavy or double weight variety called deuterium to distinguish it from ordinary mass one hydrogen. If this plan is carried out he will then be taking three and one-third ounces of heavy water, a sizable drink.

Since the lowest production cost of heavy water declared probable is about $5 a gram, the drink already taken has a minimum value of about $50. The largest dose scheduled is worth at this rate about $500 and the whole experiment will use about $4000 worth of heavy water alone. The present U. S. market price of heavy water is $19 a gram.

Slows Life

Because heavy hydrogen is double the weight of the ordinary kind, it was suspected that it might have unusual effects on life. First experiments performed on seeds, fish and mice showed that it slowed life processes.

A mouse fed heavy water with a medicine dropper in a University of California experiment acted very strangely, as if temporarily poisoned. Tadpoles placed in heavy water at Princeton died in an hour. Based on these preliminary experiments, it was suggested that heavy water may be a matter of life and death for all of us. San Francisco scientists advanced the idea that since heavy water has an inhibiting effect upon the normal functioning of protoplasm of which the human body is largely composed it may be that accumulation of heavy water in the tissues is the cause of old age and senility.

On the other hand Yale experiments showed that low concentrations of heavy water appear to have a stimulating effect on the growth of simple plants.

Heavy water in low concentrations was drunk for the sake of science some months ago at Freiburg, Germany, to discover how long water remains in the human body.

Human Too Large

The Oslo professor should give the heavy water to a small animal instead of experimenting on himself, Prof. Harold C. Urey of Columbia University, discoverer of heavy water, suggested when asked by Science Service to comment on the experiment. Prof. Urey was awarded the 1934 Nobel Prize in chemistry for the discovery of heavy hydrogen.

"Ten grams (one-third ounce) or 100 grams (three and one-third ounces) of heavy water is a negligible amount," said Prof. Urey, when compared with the large quantity of water in the human body. If the heavy water available were given to a small animal, instead, it would be possible to make a large portion of the water in his body consist of the heavy water which some scientists believe may be poisonous.

But Prof. Urey is not among those who felt that it would be dangerous to drink heavy water. He said:

"I have never predicted bad effects due to drinking heavy water."

Science News Letter, February 9, 1935

PSYCHIATRY

Leaders of a Community May be Psychopathic Types

LEADERS, followed and even revered in their time, are often "the most bizarre of the psychopathic types" of the period in which they live. Dr. Ruth Benedict in her illuminating ethnological study "Patterns of Culture" (Houghton, Mifflin Co.) does not exempt some of these personality patterns which have played important parts in American development.

"The Puritan divines of New England in the eighteenth century," she writes, "were the last persons whom contemporary opinion in the colonies regarded as psychopathic. Few prestige groups in any culture have been allowed such complete intellectual and emotional dictatorship as they were. They were the voice of God. Yet to a modern observer it is they, not the confused and tormented women they put to death as witches, who were the psychoneurotics of Puritan New England. A sense of guilt as extreme as they portrayed and demanded both in their own conversion experiences and in those of their converts is found in a slightly saner civilization only in institutions for mental diseases. . . . .

"In our own generation extreme forms of ego-gratification are culturally supported in a similar fashion. Arrogant and unbridled egoists as family men, as officers of the law and in business, have been again and again portrayed by novelists and dramatists, and they are familiar in every community. Like the behaviour of Puritan divines, their courses of action are often more asocial than those of the inmates of penitentiaries.

With Great Influence

"In terms of the suffering and frustration that they spread about them there is probably no comparison. There is very possibly at least as great a degree of mental warping. Yet they are entrusted with positions of great influence and importance and are as a rule fathers of families. Their impress both upon their own children and upon the structure of our society is indelible. They are not described in our manuals of psychiatry because they are supported by every tenet of our civilization. They are sure of themselves in real life in a way that is possible only to those who are oriented to the points of the compass laid down in their own culture.

"Nevertheless a future psychiatry may well ransack our novels and letters and public records for illumination upon a type of abnormality to which it would not otherwise give credence. In every society it is among this very group of the culturally encouraged and fortified that some of the most extreme types of human behaviour are fostered."

Science News Letter, February 9, 1935

Textiles that radiate heat have been devised.

GEOGRAPHY

Far East Conflict Near Gateway City to Mongolia

CHINESE and Japanese soldiers who have been battling near the Great Wall of China may determine the fate of one of the important old trade routes of the East, and perhaps the Mongolian province of Chahar, to boot.

The flare-up, at vaguely defined borders of Mongolian and Manchukuoan territory, carried the Japanese toward Kalgan, gateway city between North China and Mongolia.

Kalgan stands at the Great Wall itself. Through it runs the outstanding caravan route from Peiping up into Mongolia. The route traveled by camels and motor cars winds north from Peiping, across the Nankow Pass and thence past Kalgan into Chahar and northward to Urga, capital of Outer Mongolia. Millions of dollars' worth of furs and hides are brought through the gateway city each year, from Mongolia destined for China. Kalgan has some 20 factories where some of the goat, horse, camel, sheep, and cow hides and skins are prepared. South-bound fur-laden camels pass on the road north-bound caravans carrying tea and other Chinese goods up to Mongolia.

The Capital

Kalgan is the capital of the Mongolian province of Chahar. Dispatches have stated that a wedge of this province has already been added by Japan to the growing state of Manchukuo. Jehol, which joins Chahar on the east, was a Mongolian province before being annexed to Manchukuo.

In a diplomatic "white book" of 1932, Japan included Mongolia with Manchuria in discussing ways and means of providing food and raw materials for her over-populated Empire.

Said the "white book": "By making these two regions a source of supply for the necessaries of life, we shall be able to feel free from apprehension concerning our national existence."

Mongolia is more famed for its Gobi Desert and its unpromising stretches of country, occupied by nomads and herds, than for its farming possibilities. However, Inner Mongolia, where the war map now centers, contains good farm land and additional regions that can be irrigated.

Defense From Barbarians

Built to shut out barbarians who had a way of swooping down into China from the north, the Great Wall has gathered a long history of battles and bloodshed.

Old writings show that the Wall was built in an atmosphere of strife and gloom. Invasions of nomad tribes endangered China's civilization and her empire—so feared Shih Huang Ti, the first emperor of China, as he styled himself in the third century B.C. The emperor commanded sections of wall along the northern border to be welded into one towering thick serpent of a wall, winding up mountains, down valleys, over deserts and streams, from Turkestan to the Yellow Sea. The length, including some double sections, is about 1,500 miles.

Forced labor built the Great Wall. Two hundred thousand convicts with iron collars round their necks worked until they died in their tracks. Bodies of dead were tossed into the foundations, said a tradition, and the Wall came to be called Greatest Cemetery on Earth. China's early equivalent of Russian banishment to Siberia was to ship political prisoners and undesirables off north to sweat and strain in the wall-building crews. Even so, more workers were needed, and the emperor-builder drafted, so it is said, every third able-bodied man in his kingdom.

He died before it was finished, and later emperors made additions and repairs. The Wall became a barrier 15 to 25 feet thick, 15 to 30 feet high, made of stone, brick, and earth, and reinforced by thousands of towers. It was Western ignorance regarding the Far East that caused this Chinese engineering triumph to be omitted as an eighth wonder on the list of the famous Seven Wonders of the World.

The Great Wall, mighty as it looked, proved too weak a barrier at times to keep out foes. Genghis Khan and his Mongol army swept over the Wall and drove out the reigning emperor of China in the thirteenth century, and his grandson Kublai Khan founded a new dynasty of Chinese emperors. Manchus in 1644 forced the Wall, and inaugurated the Manchu dynasty. The very areas that the Great Wall was built to exclude became outer territories of the Empire in times of expansion, identified as Mongolia and Manchuria.

In the present conflict, when the tug-of-war over territory is more of an east-west struggle than north-south, the Great Wall is still something more than a symbol. It marks a southern boundary for the fighting, not likely to be passed. South of the Great Wall, China proper swarms with its congested millions and its own insistent food problems. North of the Wall is the land in which Japan is interested—the broad steppes of Mongolia, not very thickly inhabited and capable of growing food for many more people than they now support.

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RADIO

Tuesday, February 12, 4:30 p. m.

THE MARCH OF THE MICROBES, by Homer N. Calver, Public Health Consultant, New York City.

Tuesday, February 19, 4:30 p. m.

MENTAL HEALTH, HAPPINESS AND EFFICIENCY, by Dr. C. A. Bonner, Superintendent, Danvers State Hospital, Massachusetts.

In the Science Service series of radio addresses given by eminent scientists over the Columbia Broadcasting System.

ENTOMOLOGY

Destructive White Grubs Encouraged By Some Trees

WARNING that certain species of trees, most especially bur oak, planned for use in the Great Plains shelterbelt development, are encouragers of white grubs, a destructive soil pest, is issued by C. L. Fluke, Jr., and Paul O. Ritcher of the University of Wisconsin (*Science*, Jan. 18.)

White grubs are the larval stage of June beetles. These beetles in the adult stage have marked preferences for certain trees, and where these trees abound the white grubs are found most thickly infesting the soil, the Wisconsin entomologists have observed. They suggest therefore that in selecting trees for shelterbelt purposes, those species should be planted which are least likely to lead to a plague of the root-destroying grubs.

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AQUICULTURE

NATURE RAMBLINGS
by Frank Thone

Under-Water Hayfields

NO MORE hay to feed the cows? Then let them eat water-lilies.

This is not an Alice-in-Wonderland parody on the famous phrase credited with helping to provoke the French Revolution. It is a serious suggestion by a practical chemist who has been analyzing hay made from water plants, and finds that it has distinct possibilities. If the drought does not let up next summer, we may see farmers who have access to weed-choked ponds and shallow lakes fattening their livestock on this now neglected vegetation.

These weeds can be dried out into hay richer in some essential nutrient elements than any of the conventional fodders except alfalfa and other legume hays.

Experiments demonstrating this have been performed by scientists working independently of each other at two institutions: Dr. H. J. Harper and H. A. Daniel at Oklahoma A. and M. College, and Dr. Ross Aiken Gortner at the University of Minnesota. The suggestion that lakes be harvested for hay, at least in emergency years, comes from Dr. Gortner.

The water plants analyzed by Dr. Gortner included practically all species that grow in the Minnesota lakes. They were found to excel especially in "ash," or mineral content, and in protein. The crude protein content of the water plants ranged from 10 to 19 per cent., according to species. Yellow water-lilies showed up especially well, with 17 per cent. crude protein. Timothy hay has only 7 per cent. The legume hays range from 16 to 21 per cent. protein.

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Very good vinegar can be made from honey.

AERONAUTICS

Urge U. S. Airships for Trans-Atlantic Service

THE American flag will fly from airships crossing the Atlantic on regular commercial schedules if Congress implements the Federal Aviation Commission's recommendation for "the early inauguration of an experimental trans-Atlantic airship service to meet the competition of the new foreign ocean liners and of a projected foreign airship line."

A five-year program would cost $17,000,000 and would furnish two commercial airships of the Zeppelin type for service to and from Europe, a commercial airship terminal in the eastern United States and a "metal-clad" airship for South American service, as well as funds for research on untried types. The airships would be leased or chartered for commercial operation, but the Navy would be able to put them into instant service in wartime.

Recalling that the Graf Zeppelin has been carrying paying passengers for six years, three years of which have been spent in regular operation across the South Atlantic, the Federal Aviation Commission says that airship operation gives America the chance to capture the cream of the mail and first class passenger and express traffic to and from Europe. Now American shipping can not compete with the present or contemplated express surface liners supported by the British, French, German and Italian governments. To build but one of a necessary pair of express liners for weekly sailings would cost between $30,000,000 and $40,000,000, while that sum would provide a fleet of airships with terminals to give a twice-weekly sailing with the crossing time cut in half.

America's monopoly of helium as a safe, non-inflammable airship lifting gas, used instead of hydrogen, gives it a marked advantage over other nations. Moreover, surplus helium could be furnished the German airship interests with the understanding that they were not to compete with the American airships.

At Akron the Goodyear interests have the complete airship factory that made the Akron and the Macon for the Navy. It has been idle, except for research, for a year and the Federal Aviation Commission urges further construction work to keep the facilities intact. A training airship for the Navy to replace the German-built Los Angeles, now eleven years old, is urged.

Since the United States is the home of the only metal-covered airship ever put into service, the Commission recommends the construction of an airship of this type. The metal-clad airship was built at Detroit.

Praise for the research work of the National Advisory Committee for Aeronautics and the Weather Bureau, coupled with the recommendation that the Weather Bureau be transferred to the Department of Commerce, is contained in the Commission's report.

It is urged that the N. A. C. A. remain the central agency of governmental research in aeronautics and the coordinating body for research and development in aviation. N. A. C. A. research is responsible for the best qualities of present-day aircraft, the report observes, and the government's research has "paid for itself repeatedly in the improved service that aircraft have been able to render as a result." The making available of aviation research funds to university and research organization through the N. A. C. A. is also advised.

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•First Glances at New Books

Cytology

BIOLOGICAL MOVIE BOOKLETS: VOL. I, NORMAL CELL DIVISION; VOL. II, MATURATION OF SPERM; VOL. VI, FERTILIZATION—Clyde E. Keeler—*American Genetic Association,* Set, $1.50 (Separately: Vol. I, 50c; Vol. II, 60c; Vol. VI, 70c.) Remember the little booklets of pre-movie days, in which by fluttering the leaves you could see a dancer gyrate, or an acrobat perform? Dr. Keeler has turned this near-antique amusement device into an excellent visual educational method: on the fluttering pages you can now see the dance of the chromosomes as a flowing performance rather than as a series of stiff and difficult disconnected diagrams side by side on a page. It ought to make life much more bearable for thousands of freshmen.

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Physics

ENERGY AND MATTER—Charles B. Bazzoni—*University Society,* 137 p., cloth, $1., paper 65c. Concise, non-technical review of energy and mass as they enter modern views of atomic theory. It contains some elementary concepts of wave mechanics and sections on the positron and neutron.

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Botany

KEY TO THE RUSTS OF THE PACIFIC NORTHWEST—J. W. Hotson—*Univ. of Washington Press,* 193 p., $1.50. This publication should be of great use to phytopathologists and to mycologists generally, not only in the region for which it is specially designed but also over North America generally. Primary "key" divisions are by host plants, secondary divisions by mycological characters; descriptions are inserted in the key. It seems like an excellent arrangement.

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Chemical Technology

THE SCIENCE OF RUBBER (*Handbuch der Kautschukwissenschaft*)—Ed. by K. Memmler in collaboration with L. Hock and others. Authorized English translation ed. by R. F. Dunbrook and V. N. Morris in collaboration with ten members of the Firestone Research Laboratories — *Reinhold Publishing Corp.,* 770 p., $15. Just five years have passed since the German edition of this valuable book appeared. For the half decade since then engineers and scientists who must know about rubber have been waiting for the English version. Everything from Abnormal Rubber to Zinc Oxide in Rubber appears. Do not worry about possible commercialism which might rise as a bugaboo from the title. The book is a fine job of bringing an authoritative volume up to date by men whose job it is to know the subject.

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Horticulture

SWEET CORN. (VEGETABLES OF NEW YORK, VOL. 1—PART III)—William T. Tapley, Walter D. Enzie and Glen P. Van Eseltine—*New York State Agricultural Experiment Station,* 111 p., 24 col. pl., $2.50. Professionally, this monograph will be valuable to truck farmers, canners and the vegetable trade generally; it will also interest teachers of horticulture and general botany.

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Engineering

MANUAL OF FIRE-LOSS PREVENTION OF THE FEDERAL FIRE COUNCIL—National Bureau of Standards—*Govt. Print. Off.,* 156 p., 20c. Detailed instructions upon how to prevent fire. This handbook should be of great use to industry as well as government departments.

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Aeronautics

REPORT OF THE FEDERAL AVIATION COMMISSION—*Govt. Print. Off.,* 254 p., price to be announced. An important and highly commendable feature of this report, which should serve as a model for all documents of its kind, is a section-by-section summary in the opening pages, each summary paragraph keyed with a reference number to its corresponding section in the text. (See article on page 95.)

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Biology

METHODS OF TEACHING HIGH SCHOOL BIOLOGY—A SYLLABUS—Ove S. Olson—*Burgess Publishing Co.,* 67 mimeographed leaves, $1.25.

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Economics

YOU AND MACHINES—William F. Ogburn—*American Council on Education,* 55 p., 15c. This is the pamphlet intended for CCC camps which did not get there, but is now published by the American Council on Education. Some of the subheads are: Man Without Machines—Babes in the Woods; The Machine Takes Our Jobs Away; Machines Create Jobs, Too; A Poor Man Can't Own a Big Machine; The Machine is as Dangerous as a Wild Animal; Cities are the Creatures of Machines; The Inventors of the Automobile Exerted Much More Influence on History than Napoleon, etc. The author is the University of Chicago sociologist. Cartoons by F. G. Cooper point the text.

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Archaeology

A MANUAL OF EXCAVATION IN THE NEAR EAST—William Frederic Badè—*Univ. of California Press,* 81 p., $1.50. Increasingly in the future, predicts Dr. Badè, students of archaeological reports will desire information on the methods employed. Not only is the technique of digging, preserving, and recording very helpful to workers who are gaining experience, but the technique is often important to any one wishing to judge the value of the research. In this slim manual, Dr. Badè shows just what he means, by presenting a practical, specific explanation with illustrations, of his methods used at Tell en-Nasbeh. While he is writing of Palestine, much of what he explains is useful for archaeology in other fields.

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Botany

FLORA OF THE NIAGARA FRONTIER REGION—Charles A. Zenkert—*Buffalo Society of Natural Sciences,* 328 p., map, $2; map, 10c. A worthy addition to the growing list of regional and local floras, which make life much more livable for a botanist finding himself in "foreign parts." This book applies to an especially interesting floral area.

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